

Mosquito Bay Oil Spill: Report to RRT on *In-Situ* Burns

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On 11 April 2001, the Unified Command (UC) requested permission to conduct a series of *in-situ* burns at a spill site in a remote coastal marsh. The location of the spill was approximately 29° 16.5' N Lat., 091° 10.7' W Long. and adjacent to Mosquito Bay, Louisiana. The area of the spill is extremely remote and can only be reached by boat or helicopter. Original estimates of the spill size were extremely inaccurate as much of the affected area was within the heavy marsh and could not be accurately estimated from the air. Once the marsh had been ground-truthed, a more accurate estimate of 1000 bbl of condensate oil (crude oil co-produced in a primarily gas well) had been released. Marsh impacted by observed oil was estimated at 37 acres. The leak is suspected to have come from a 20 inch pipeline which carried natural gas and condensate. This pipeline carried gas and condensate that had been siphoned off of several producing gas wells, which resulted in a very large volume of condensate flowing through the line. The cause of the leak is still under investigation. Because the spill was largely contained in low areas of interior marsh, conventional oil recovery techniques and mitigation would cause unacceptable physical marsh impact; therefore, *in-situ* burning was considered the most environmentally friendly approach to minimize impact from the oil spill. The weathered condensate oil has many of the characteristics of diesel fuel. Since the spilled oil was relatively transparent, the depth of oil on water within the marsh could be delineated using a shovel. Again, such observations would not be apparent from aerial surveys.

After presenting the plan to the RRT on 11 April 2001 and an interactive conference call, the RRT granted approval for the use of *in-situ* burning. A short post-burn report was requested by the RRT; this report is intended to satisfy that request. Note, this report was written shortly after the *in-situ* burns; it contains observations made by the NOAA SSC and has not been extensively reviewed. More detailed reports are planned after the preliminary monitoring and recovery data becomes available.

The approved plan included an initial “test” burn in Zone 1 to be followed by a second burn in the most heavily impacted areas if the UC deemed the burns effective in reducing environmental impact from the spill. Criteria to evaluate the first burn was defined as follows: 1) The oil should burn readily and efficiently. 2) Unoiled areas should not burn beyond our control efforts. 3) There should be no evidence of burn residue or soil impacts that would cause more impacts than the oil alone. 4) The plume should not pose risks to downwind resources. If the initial burn was deemed successful by the UC, Zones 4, 3, and parts of Zone 2 would be burned. It was expected that the burn would primarily follow the pools of surface oil, but some adjacent drier areas were expected to be burned as well. It was the consensus of the on-scene responders that burning was the proper course of action. The landowner’s representative, representing the Arch Diocese of New Orleans as the landowner, said he had no concerns about the burn progressing into adjacent areas since the marsh was routinely burned for management purposes.

Beginning at 0745 hrs on 12 April, preburn surveys which included sampling and photoquad documentation were conducted in Zone 1. The time of the survey was about three hours before high tide. Oil thickness was 0.5 cm with a 0.1 cm water layer between the oil and the marsh surface was observed. The water level was expected to increase with the rising tide. Preburn samples and photoquads were collected. The Gulf Strike Team “SMART” team was set up to conduct air sampling. Members of Williams Fire Services were contracted to provide fire protection to the nearby “Williams Energy” facility where the pipeline originated; the facility was located just offshore from the oiled area. Just before 0900 hrs, Zone 1 was ignited using a flare gun. The fire was slow to start, but eventually the pool of oil was fully evolved in flames. Although a fire break was constructed using an airboat prior to the burn, the fire progressed downwind and outside of the planned burn area. An estimated 40 acres of marsh was burned.

Further burning was not conducted because the wind speed had increased to 15-20 knots and all agreed that control of the burn would not be possible. Airboats were used to control the edges of the fire in Zone 1 and the fire eventually burned out at the water’s edge. Airboats were also used to extinguish the burn where it was approaching Zone 2 to insure that the fire did not burn into this area overnight.

While more marsh burned than originally predicted in the test burn area and some birds (all of which were thought to be rails) were killed, the UC felt that burning was still the preferred option especially if the winds diminished. The bird mortality observations were not quantified as that would require additional marsh impact, as observers would trample the now exposed marsh flats causing additional environmental damage.

Several calls to resource trustees were made to confirm this opinion and it was concluded that some birds are often killed during normal management prescribed burns. The land manager restated that the entire island could be burned without his objection. However, the UC still desired to minimize any collateral burns to the unoiled marsh.

During the evening debrief and planning meeting, the tradeoffs between burning at first light when the wind speeds would be lowest and burning at mid-tide when water levels in the marsh would be higher (predicted to be about 1100 on Friday) were discussed. It was decided that the burn in the oil area would begin around 0900 hrs, as a compromise between the higher winds and higher tides. Doug Walton (NIST) and Buddy Goatcher (USFWS) were contact to discuss strategies to minimize collateral burn impact. During the second burn, a back burn strategy was attempted to minimize collateral burn damage. It was understood from the beginning that *in-situ* burning of oiled marshes is a developing science; new lessons were being learned during this response which will be used for future responses. After the initial burn, we were comforted by the fact that the spill was on an island which provided it's own measure of burn control should the winds again drive the oil past the targeted burn zones.

On Good Friday, 13 April, the winds had diminished to less than 5 knots and a second *in-situ* burn was conducted at the pipeline leak and adjacent contaminated marsh. Back-burn (down-wind) fires were set north of the target burn area just before 0900 hrs, but these initial fires exhibited very slow progress back toward the main oiled zone. When the winds began to freshen to between 5 and 10 knots, pools of oil on the up-wind side, near the pipeline leak (this area is called "ground zero" by the responders and is the most contaminated) were ignited using a flare gun and road flares. The oiled areas readily ignited. The winds never exceeded the 15 knots window authorized by the RRT and averaged less than 10 knots the entire day. Some collateral burn was observed, but no dead birds were observed due to collateral damage. It was thought that the combination of back burns and reduced wind speed allowed better wildlife escape. A small oiled area outside of the burn area in Zone 3 was identified. The on-scene command elected not to burn this area since the expected collateral burn would be great relative to the small amount of oil removed. The NOAA SSC supported this decision. Some 50 acres of marsh was burned on 13 April; most of this area was within the target burn zone, although once again some collateral burn occurred.

Surveys at the end of the burn estimated that 90-95% of the recoverable surface oil had burned off. Oil was still observed subsurface in the thousands of fiddler crab burrows (some of which where burning like small lamps during the post-burn survey). A pit dug at the site where the

repair was to be made immediately reignited. Maintenance plans to collect any released oil caused by subsequent rains were developed and implemented.

Overall, the *in-situ* burns were considered successful. Given that any response in a sensitive marsh will involve negative environmental trade-offs, the use of *in-situ* burning was thought to have the least environmental impact and the highest removal efficiency for surface oil contamination. Relative to any additional emergency mitigation, the UC with endorsement from the NOAA SSC has taken a “wait and see approach.” If the marsh grasses begin to recover in the heavily impacted area, the most environmentally friendly response maybe natural recovery of residual contamination. Any additional transport into the marsh will cause subsequent physical environmental damage; the type of damage that was minimized by using *in-situ* burning.

A contractor was hired to conduct post-burn monitoring as required by the state. This information will be available to the UC and interested trustees. The UC will continue to assess options to further environmental recovery of the impacted marsh. Attached are a series of photographs taken by NOAA.



Aerial view looking south toward the Gulf of Mexico (11 April 2001).



Same aerial view with work areas (areas of contamination) roughly delineated.



Part of Work Area 3 (11 April 2001). The white dots are bags of new adsorbents. The brown area on the right side of the pond is adsorbents in oil.



Work Area 1 (11 April 2001)



NOAA Scientist (Jacqui Michel) during a marsh survey on 12 April 2001.



Sorbents in oil in Work Area 3 on 11 April 2001. The adsorbents clearly soaked up spilled oil, but there is far too much oil for adsorbents to be an effective response tool in this area.



Condensate oil on water in marsh vegetation (11 April 2001).



Oil which seeped into a pit dug near Ground Zero (11 April 2001).



Test burn in Work Area 1 (12 April 2001).



Part of Work Area 1 after in-situ burning (12 April 2001).



Aerial view at the end of operations on 12 April 2001.



Ground view of the small inlet in Work Area 1 post-burn (12 April 2001).



Shortly after igniting oil in Work Zone 4 (13 April 2001).



Shortly after igniting the oil in Work Zone 2 (13 April 2001).



Aerial view of the in-situ burn on 13 April 2001.



Unoiled or lightly oiled marsh continuing to burn (13 April 2001). The stake marks the edge of the heavily oiled Work Zone 4.



Stubble continues to burn in Work Zone 4 (13 April 2001)



Close up of post-burn marsh stubble (13 April 2001).



A crab burrow continues to burn in Work Zone 4 (13 April 2001).



Oil seeping from a crab burrow due to the pressure applied from standing near the burrow (13 April 2001).



Excavation of a pit in the area where pipeline repair must be made (13 April 2001).
The oil in the subsurface sediment reignited.



Aerial view as the NOAA SSC left the scene on 13 April 2001. The burn area to the left is from 12 April 2001.